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Architectural membranes for high-performance building Skins
Latest material developments
Case study: façade in Ecuador

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Summary. This document provides information on a façade project in Ecuador. The office building in Esmeraldas was recently wrapped in Low & Bonar's TF400 mesh. Apart from creating a homogeneous layout for the whole building, the mesh membrane serves as a sun and wind screen.

1 INTRODUCTION

The city of Esmeraldas on the west coast of Ecuador is mostly known for its port and the head office of Flopec, the national petrol company. When Flopec decided to build a new head office building, the local municipalities succeeded in combining this with a development of urban landscaping. In between the coastline and the city centre there is now not only the new office building but as well lots of recreation space, restaurants, little shops and an open air cinema. In order to give a unifying appearance to all these structures the designers used tensile structures as common element. There is the prominent wrap of the office building on the one hand and a prismatic roof above the restaurant and shop structures on the other.

Figure 1: Flopec Building in Esmeraldas with Low & Bonar screen, Photo by Preysi, Ecuador

The building is completely wrapped into a white mesh fabric. Therefore the façade smoothly integrates into the colour of the sky. Structurally the architect Marlon Guillén used a steel construction which was first filled with the primary façade. In front of this climatic envelope lies the secondary façade: a 16.000 sq. textile wrap.

The fabric serves as sun screen and wind shield. Being so close to the equator, Esmeralda is facing an extremely bright sun light. In order to avoid mechanical, individual sun shading systems the architect chose a universal wrap for the whole building. At the same time the mesh fabric reduces the wind loads significantly. Half of it is carried by the primary, the other by the secondary structure. It is the biggest tensile façade in Ecuador – maybe even in South America.

There is yet another side effect: during night time the façade serves as a cinema screen. Apart from the office building and the urban landscaping the architect designed a little projection hut. At night time people watch the cinema façade.

2 SETTING

2.1 Light in Abundance

Ecuador is literally one of the lightest countries in the world. Where you have sun light in abundance you need to care more about how to get the sun light ***out*** than the other way around – especially when it comes to office spaces. To provide homogeneously lit offices is one of the main tasks where glare is a significant problem.

2.2 Sea Side Setting

Of course the pros and cons of an office building right on the beach are easily outlined: the view on the ocean is a merit for any office work place. Nonetheless being right next to one of the windiest spots in Ecuador means that you cannot easily open a window - unless you want to reorganize all loose paper on your desk. In all administrative areas it adds to the employees' well-being if they are able to open their windows individually.

3 FABRIC SOLUTION

The Ecuadorian architects convinced the user of the office building that a fabric wind and sun screen was the optimal solution for the specific climatic conditions on Esmeralda's coastline. The permanent screen that wraps almost the whole building is made of a vinyl-coated polyester fabric. Low & Bonar GmbH provided the fabric "made in Germany", the Ecuadorian manufacturer Preysi prefabricated the membrane modules in Quito and installed them in Esmeraldas. For this Preysi used the prefabricated tensioning systems of Facid.

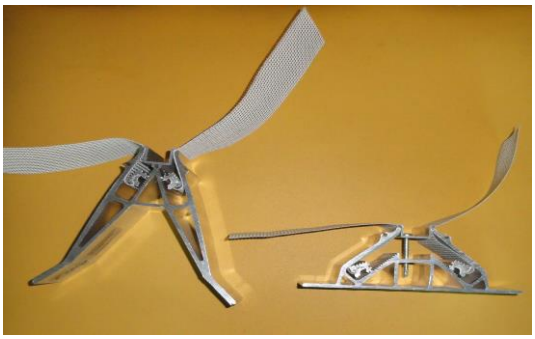

Figure 2: Facid65 – membrane tensioning system

4 SUB CONSTRUCTION

Before the fabrics came to the building site the construction seemed to be an ordinary steelwork. In fact it is no complicated task to prepare a façade for a tensile wrap. Similar to other claddings there are only a couple of fixation points as links between façade and main building. What is important in tensile architecture is that the loads of the cladding material are significantly lower than that of aluminum panels for example – let alone that of stone claddings. Wind loads for example are shared between sub- and main-construction: As for the applied mesh TF400 for example there is an open area of around 30% which means that the loads on the building's steel construction are shared between primary and secondary structure.

The fixation of the fabric clipping system is easy enough: only about three of Preysi's installation experts were needed to get the aluminum profiles on the steel construction. Clipping the prefabricated mesh into these profiles happens within a couple of minutes so that huge triangular panels of the TF400 mesh were installed quickly.

Figure 3: aluminum clipping profiles on steel construction, Photo by Preysi

Figure 4: first steps of installation, Photo by Preysi

For everybody involved in tensile architecture it is the moment when the fabric comes to the site that is most important. The following picture gives a perfect impression of the actual ***textile*** character of the fabric. Of course fabrics in big scale architecture make only sense and are structurally only feasible when tensioned. But having the prefabricated fabric lying on the ground reveals the fact that we are still talking about a ***woven*** material – even if it is a technically highly sophisticated product.

Figure 5: Low and Bonar's TF400 Mesh Fabric as a cloth before installation, Photo by Preysi

5 THE FABRIC: VALMEX TF400 MESH FABRIC

The mesh is woven of high tenancy polyester yarns. Low & Bonar use a specific weaving technology that makes the mesh geometrically stable. The yarn went through a low-wick treatment first. That means that the polyester does not allow any wicking of humidity into the fabric. Together with the coating the fabric has a ***no-wicking*** property.

The company's weaving mill is situated in Fulda, Germany, right next to the coating lines. There the woven fabric is first equipped with an adhesion layer. This facilitates the bonding of the vinyl compound with the fabric. A proper connection is crucial for many functionalities which fabric and coating deliver as a joint venture. The top layer on the fabric is a lacquer which provides the final protection of the whole compound. Low & Bonar is market leader in providing a weldable pvdf lacquer: usually a high share of Fluor in the top coat means that this layer must be removed before welding. Fluor is important when it comes to cleanability and thus a long lasting performance of the material. Low & Bonar provides an extremely high Fluor content on the one hand while making abrasion for welding unnecessary on the other. This significantly lowers the risk of having damages during the manufacturing process and hence leads to an outstandingly long durability. Additionally Low & Bonar provides a Nano lacquer which enhances cleanability further by lowering down the material's surface energy – water droplets or dirt particles have minimised contact surfaces on the fabric and hence wash off easily – a property that is widely known as lotus effect.

Figure 6: installation of the prefabricated material almost finished, Photo by Preysi

Low & Bonar provides fabrics up to a width of five metres that means that welding seams

will not often disturb the homogeneous outlook of the façade. Preysi chose the panel size accordingly.

The colour of the fabric was a custom made bright white version of the mesh which is regularly done in colours like silver and black or equipped with a finish that allows long lasting prints on the fabric. In the case of the Flopec building the white wrap is used as a cinema screen by night.

Figure 7: cinema projection at night, Photo by Preysi

6 CONCLUSIONS

- A fabric mesh is a perfect solution for façades that are meant to have a homogenous appearance.

- Having a fabric sun and wind screen improves working conditions in the offices while simultaneously facilitating the load transfer between primary and secondary structure.

- The prefabricated membrane reduces significantly the installation time on site.

REFERENCES

[1] All pictures taken by the manufacturer Preysi, Quito, Ecuador